INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

Mobile Vacuum Extraction Remediation Systems

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This evaluation does not approve this technology nor does it verify its effectiveness in conditions not identified here. Mention of trade names or commercial products does not constitute endorsement or recommendation by the IDEM for use.

This memo is OLQ Geological Services's evaluation and current position on Mobile Vacuum Extraction Remediation Systems (MVERS). MVERS are typically truck mounted liquid ring vacuum systems consisting of a high flow velocity and high vacuum liquid ring pump, a liquids storage tank, and rarely; a vapor effluent treatment system. These types of mobile vacuum systems have various trade names, but are often identified by the generic name; "Vac Trucks."

There has been an increase in the utilization of MVERS to perform remediation at gasoline service sites by extracting subsurface product, groundwater, and vapors from monitoring and recovery wells. Formerly, "Vac Truck" usage was restricted to vacuuming up liquid and solid contaminant surface spills, tank product and sludge removals, and vapor extraction from sewers.

A typical MVERS "event" consists of attaching the system vacuum hose(s) to one to eight wells, and operating the system for four to eight hours. The induced vacuum causes fluids and vapors to be drawn to the well(s), which are then extracted, and discharged into the storage tank. Vapors captured and generated during the event are subsequently released to the surrounding air, usually without treatment.

The frequency of MVERS usage is variable. MVERS have been proposed and utilized for singular events, weekly events for a three-month period, quarterly, and semi-annually. However, quarterly usage is the most often proposed. It has been promoted as a cost effective method to remove or reduce free product and dissolved contamination, thereby enabling the site to be eligible for a risk based closure, a monitoring only remediation program, or a reduced sized secondary remediation system.

Based upon the usage of MVERS at petroleum-contaminated sites in Indiana, the following have been determined as limitations of the technology, as well as problems encountered in its use:

- Vacuum extraction systems are inherently most effective on surface contamination, where no restrictions to flow are encountered. When utilized for subsurface contamination, MVERS appears to be highly effective on localized volatile organic contamination (VOC) within a highly conductive sand and gravel lithology, i.e. a recent localized gasoline spill in a loose sand and gravel formation.

- Vacuum-based remediations rely on interconnectivity of soil pores to allow air, water, and product to effectively flow through the soil. The effectiveness of vacuum systems can be substantially reduced by:

  - Increasing percentage of soil fines (silts and clays),
  - increasing compaction of the soil,
  -decreasing contaminant volatility,
  -decreasing duration or frequency of pumping, and
  -decreasing applied vacuum.

In addition to the above limitations, the following have been identified as problems encountered in MVERS implementation:

- Older contaminant releases into clays and silts have been highly resistive to vacuum based remediation, regardless of the vacuum applied; because the contamination sorbs to the fine soil particles, there is little connectivity of soil pores, and the plume has had a long time to migrate from the source area.

- Extraction events have not been timed frequently enough to allow effective remediation based upon the site conditions. MVERS have often been inappropriately utilized on an infrequent short-term basis in soils poorly suited to vacuum extraction, where the plume has had a significant amount of time to sorb from the source. The end result being that short term contaminant reductions are seen only in close proximity of the well pumped. Although some residual contaminant reduction effects can remain, the amount of hydrocarbons removed is low.

  To increase effectiveness, more frequent and longer extraction events are required. However, the cost effectiveness of MVERS remediation vs. alternative remedial methods is reduced with each subsequent site visit.

- The amount of contamination removed by such systems is often reported in pounds of hydrocarbons, pounds of VOCs, or equivalent gallons of gasoline. The numbers are frequently calculated from photoionization detector readings collected from the vapor effluent. Although the numbers reported can appear impressive, they poorly correlate to actual liquid concentrations, and often represent a minor quantity of contamination in relation to the amount of

contaminants remaining.

- Required IDEM air registrations or permitting are frequently not obtained for regulated vapor discharges. Additionally, post treatment sampling of the vapor discharge is rarely conducted to determine if applicable air discharge restrictions are being met.

It appears that the most effective usage of MVERS is on:

- Surface spills,

- recent VOC spills in loose sands and gravels where the contamination is localized near the source, and

- recent VOC and semi-VOC spills in source areas, where the contamination has been contained by silts and clays, and has not had sufficient time to significantly sorb from the source area into the silts and clays.

Regardless of its application, extraction events must be of sufficient duration and frequency in order to be effective. Additionally, all applicable permits must be obtained. Also, all discharges must be appropriately monitored for regulatory compliance, and treated when the effluent would exceed permitted standards.

If you have any questions concerning an MVERS type of remediation, please contact Geological Services.

This document is based on current information. It will be revised as additional data is acquired and evaluated.